Recommendations of an Advisory Committee on Facilitating Geospatial Data Sharing
-- a subcommittee of the Nebraska GIS Steering Committee

FACILITATING GEOSPATIAL DATA SHARING IN NEBRASKA

Meeting the Growing Needs for Enterprise-wide Access to Available Geospatial Data

adopted by Nebraska GIS Steering Committee on 9-5-02

INTRODUCTION

Timely, accurate information, easily accessed and capable of being shared across federal, state, and local political jurisdictions is now recognized as a fundamental component of sound public policy decision-making and good, efficient government. Over the last decade public entities have invested in the development of compatible database structures and networks to facilitate data sharing in pursuit of these information-sharing objectives.

During this same period, an increasing number of public and private entities have discovered that Geographic Information Systems (GIS) provide powerful tools for displaying, combining, and analyzing information based on its geographic location (latitude/longitude, etc.). GIS is now used by a wide variety of public entities for an even wider variety of applications. These applications range from reapportionment, emergency vehicle routing, highway pavement management, water quality management, property assessment, economic development, public health, and the more recent applications related to homeland security planning and response.

As more and more public and private entities adopt GIS technology, it has become increasingly important that institutions be developed to facilitate the reliable and efficient sharing of the geospatial information integral to these systems. The public costs of developing geospatial databases are one of the important reasons for developing mechanisms to facilitate data sharing. Today's governments can not afford to have multiple agencies investing scarce public resources in the development and maintenance of duplicate (or similar) databases. Sound public policy decisions are more likely when multiple agencies (state, local and federal) are making decisions based on the same data. Increased efficiency and enhanced public policy decisions-making will be likely results of coordinated public investments in the development and maintenance of quality, core geospatial databases coupled with mechanisms to share this data widely among public and private entities.

The terrorist attacks of September 11th have illustrated that it is also important that data sharing mechanisms be reliable in times of crisis, that they provide ready access to the most recent data maintained by multiple agencies, and that they provide access to data that has been pre-formatted to facilitate its rapid integration with other geospatial data. It was to address this range of needs and concerns that the intergovernmental Advisory Committee on Facilitating Geospatial Data Sharing was created and tasked with making recommendations for how we might meet the growing needs for enterprise-wide, ready access to available geospatial data.

BACKGROUND

While GIS can no longer be considered a new technology, its wide spread use among many agencies, many applications and numerous users is relatively new. In Nebraska, the Conservation and Survey Division at UNL was one of the early experimenters with GIS technology starting back in 1985. Other early users were the Nebraska Natural Resources

Commission starting in '89, the Legislature in '91, the Dept. of Roads in '91, the Dept. of Environmental Quality in '92 and Game and Parks in '94. During this same period a similar limited, specialized use of GIS was evolving in federal and local government agencies. In all of these instances, the early GIS users were based in just a few agencies, the specialized applications residing only on the computers operated by skilled technicians, and the applications relied on geospatial data that was primarily developed and maintained within that same agency.

However, over the last few years the nature of GIS users and applications has undergone major changes. These changes are related to the growing awareness of the potential of GIS technology, and the evolution of the technology in terms of its sophistication and ease of use. The current trend is toward widespread use of GIS technology across both the horizontal and vertical breath of public and private agencies. As a result of these changes, people with a wide range of technical skills are now using the technology. Many current GIS applications rely on the ability to readily access a variety of geospatial databases (roads, streams, aerial imagery, political boundaries and property parcels) that are both dynamic in nature and maintained by a variety of public and private entities. The relatively new phenomenon of providing a wide range of interactive GIS applications over the Internet (i.e. general public access of assessor's property parcel information via the Internet) is just one example that illustrates these trends.

These trends in GIS software, applications, and users have served to heighten the demand for mechanisms that facilitate easy, reliable, enterprise-wide access to geospatial databases that are developed and maintained by a variety of entities. Also contributing to this increasing demand for geospatial data sharing, has been a growing recognition that with limited public resources available it is vitally important that public entities avoid costly duplication by cooperating in the development and maintenance of the geospatial databases that are needed for many GIS applications

In pursuit of this intergovernmental cooperation, several state and federal geospatial coordination initiatives have been organized. Many of these coordination efforts have focused on a core subset of geospatial databases (roads, streams, aerial imagery, political boundaries, property parcels, etc.) that have become known as Framework Databases because they provide the underlying framework for so many GIS applications. Most of these coordination initiatives also highlight the need for mechanisms to provide easy access, across the enterprise, for these and other geospatial databases. Among these coordination initiatives are the following.

Nebraska GIS Steering Committee. Over the last several years this intergovernmental coordinating body has outlined in its annual reports the need and plans for the coordinated development of key geospatial databases on a statewide basis. These strategic reports have also consistently noted the needs for enhanced mechanisms for facilitating online geospatial data access and sharing across the enterprise.

Federal Geographic Data Committee. The FGDC is a federal level GIS coordinating body that works closely with its state counterparts. The FGDC took the lead in identifying Framework Databases, developing database standards, and actively works with states to encourage the development of a national network of geospatial data clearinghouses as a means to find and provide online access to existing geospatial data.

Implementation Teams. Implementation Teams (I-Teams) are a national initiative to bring together representatives of state, local, federal and private entities to define collaborative strategies for the development of widely needed geospatial databases and the means to distribute them. One of the priority needs identified in the draft Nebraska I-Team Strategic Plan is the development of a geospatial data center to serve the Nebraska GIS user community.

USGS National Map. For many years the US Geological Survey's 7.5" paper topography maps have served as the standard reference map for a wide variety of applications. Many state statutes, including Nebraska's, refer to these maps. Most of these maps are at least 30 years old and in need of revision and updating. As part of its National Map strategy, the USGS has made a strategic decision that it will rely on digital geospatial data, created largely at the state and local level, as the means to update and keep relatively current these standard reference maps. As currently envisioned, this evolving strategy will rely heavily on state-by-state data centers that provide the focal point for collecting, integrating, and providing online access to the digital geospatial data (see State of Delaware pilot, *http://datamil.udel.edu*).

Homeland Security. In the wake of the September 11th terrorist attacks the critical importance of ready, reliable access to a cross-section of geospatial data, from a wide variety of agencies, has become very clear. At the federal, state and local level, GIS and geospatial data collected from a variety of sources is being used for short-term homeland security planning efforts. In the longer-term, it will be important to be able to quickly access the most current geospatial data, from a variety of sources, to provide an informed basis for responding to emergencies.

CURRENT STATUS

There are currently two state-operated geospatial data clearinghouses, which allow GIS users to conduct online searches for available geospatial data related to the Nebraska geographic area. There are also several online clearinghouses operated by federal agencies, at the national or regional level, which contain Nebraska-related geospatial data among their data catalogues. Both of the state-operated clearinghouses are compatible with the FGDC national clearinghouse network. However, neither is comprehensive in the scope of their listings and as a consequence there are numerous existing Nebraska-related geospatial databases that are not currently listed and therefore not available through the clearinghouse network.

The Nebraska Department of Natural Resources operates one clearinghouse, which provides a comprehensive online, up-to-date listing of the data holdings in its Natural Resources Databank. Through this clearinghouse, online access is available to most, if not all, of the data holdings of the NDNR Databank.

The other state-operated clearinghouse, the Nebraska Geospatial Data Clearinghouse, was developed under the auspices of the Nebraska GIS Steering Committee, in cooperation with the Nebraska Library Commission. This clearinghouse node was originally developed as a pilot project, with the goal of ultimately building a comprehensive clearinghouse for Nebraska-related geospatial data. The clearinghouse was initially developed in 1995-96, with the support of an FGDC grant. As part of this pilot project, the necessary documentation was created for approximately 45 geospatial databases and an online clearinghouse node was established on a Nebraska Library Commission server. This clearinghouse node has since been moved to servers operated by Nebraska Online.

Unfortunately, since the completion of this clearinghouse pilot project, the GIS Steering Committee has not had the resources to continue the necessary outreach and education work with agencies to get their data documented and added to the clearinghouse catalogue. There are now numerous Nebraska-related geospatial databases that have been developed at the state and local level, but which are not currently documented and have not been added to the Nebraska Geospatial Data Clearinghouse catalogue. As a consequence, GIS users can not easily discover that these databases exist and they are not readily available for online access.

Related Initiatives. In exploring how we can best address the current gaps in providing online access to Nebraska-related geospatial data, it is important to consider several related initiatives

that are currently underway or planned. In this time of scarce public resources, cooperation and coordination among these initiatives may hold the key to developing of a more comprehensive and enduring approach to facilitating Nebraska geospatial data sharing.

On the federal level, there are several related initiatives that are being proposed and/or developed. Among these is the evolving USGS vision of the National Map, and its proposed implementation through a series of state or regionally-based online digital mapping portals. While this initiative will probably not be as comprehensive in terms of the range of Nebraska-related data themes, it will however involve many of the same databases and similar infrastructure. America View is another USGS pilot program with possible synergy for the development of an enhanced Nebraska geospatial data center. The goal of America View is the development of state-level distribution mechanisms to provide rapid online access to recent satellite data. Another related initiative is the USGS pilot program to develop state-based USGS Mapping Project Offices, as one way to develop closer coordination with states and decentralize some of its national mapping operations. Finally, the President's Geospatial One Stop E-Government Initiative envisions creating a single Internet portal through which one could locate and access all federal agency geospatial data.

All of these federal initiatives share an understanding that if they are to be successful, they will require a fairly high degree of coordination with states. At the same time, it is also important to note that most of these initiatives do not currently have new funding available that could be used to help states provide the on-going support needed to maintain a geospatial data center.

On the state level there are also several initiatives that could possibly lend support to the development of an enhanced Nebraska geospatial data center. The Dept. of Natural Resources has agreed to host a combined clearinghouse (NDNR Databank and Nebraska Geospatial Data Clearinghouse) on their servers, given proper endorsement and support. The UNL Libraries have offered to conduct a survey of state agencies, universities, and natural resource districts to identify the geospatial data that are currently available but not listed in a clearinghouse and to help document that data.

The University of Nebraska Peter Kiewit Institute has recently announced that they will be acquiring a large scale server and creating an internet ESRI interactive map interface and web site to allow users to more easily locate and select location-based information along the Lewis and Clark Bicentennial (2003-2006) Celebration route. They have also expressed an interest in hosting and serving state geospatial data on this server. Several other state agencies are either considering or have developed plans to expand their current GIS capabilities (NDOR, NDEQ, NEMA, NPAT, NGPC, CSD-UNL). Many of these proposed plans involve developing additional interactive Internet mapping capabilities as a way to bring these analytical tools and information to either their field offices and/or the general public. For many of these applications, there are compelling reasons to base most of these initiatives within a specific agency. It is however a possibility that within these agency initiatives there are areas of potential collaboration that could lend support to the development of an enterprise Nebraska geospatial data center.

As avenues are explored for addressing the current need for a Nebraska geospatial data center, it is important to not forget the lessons learned from the Nebraska Geospatial Data Clearinghouse experience. If these intergovernmental data sharing programs are to be successful, they require resources for on-going development, maintenance and outreach. In considering the possible synergy of the various federal and state programs, it is quite possible that through collaboration and partnerships we may be able to bring together the hardware and software infrastructure required for an online enterprise data center. More difficult, but equally or more important are the resources necessary to provide on-going support for the operation of an enterprise such as a Nebraska geospatial data center.

RECOMMENDATIONS

At the outset of the Advisory Committee's discussions, there was general agreement that the unmet needs in this area were substantial. However, it was also acknowledged that the resources available in the short-term to help address those needs were likely to be very limited, particularly in this time of state budget shortfalls. Based upon this understanding, the Advisory Committee decided to proceed to identify the unmet needs and to take a two-fold approach to making recommendations to address those needs. This two-fold approach involved:

a) Making recommendations for short-term limited resources efforts that could be undertaken, and have a reasonable chance of success, within the current constraints of little or no additional resources;

b) Outlining a consensus longer-term vision for the policies and structures that should be pursued, as additional resources become available, to address the longer-term needs for institutional structures and policies to facilitate an on-going, high-level of geospatial data sharing among the public and private sector in Nebraska; and

c) Following an 18-month period, the GIS Steering Committee and the Department of Natural Resources shall re-evaluate the policies, barriers, opportunities and options for facilitating Nebraska-related geospatial data sharing. The purpose of this re-evaluation is to determine how well the arrangements outlined in this document are working and to make recommendations for changes as necessary

Short-term, limited resources efforts

1) Initiate a process to create a unified, enterprise-wide, Nebraska geospatial data clearinghouse with the goal of ultimately providing a one-stop portal for searching for available geospatial data related to the geographic area of Nebraska. Recommended initial steps would involve merging the two existing online geospatial catalogues/clearinghouses which are currently operated by the State of Nebraska. The metadata catalog which describes a limited, cross-section of geospatial data themes and is currently hosted on the Nebraska Online servers would be combined with the metadata catalog describing the natural resources geospatial data currently hosted by the Nebraska Department of Natural Resources Databank. This enterprise geospatial data clearinghouse node would be hosted on a NDNR server and would be structured and maintained in a manner to be compatible with the national Federal Geographic Data Committee (FGDC) geospatial data clearinghouse network. This work would be conducted primarily by the staff of NDNR (as time and resources permit), with assistance from Nebraska Online staff and the Coordinator for the Nebraska GIS Steering Committee.

2) As an enterprise-wide Nebraska geospatial data clearinghouse, it is recommended that the Nebraska GIS Steering Committee would be the ultimate owner of this enterprise clearinghouse and NDNR would be the trustee charged with operational responsibility for the clearinghouse, subject to available resources. NDNR staff commitments would require the endorsement of the NDNR Director. Under this conceptual model, the Steering Committee would have the primary responsibility to take the lead in pursuing any additional resources needed to insure adequate support for clearinghouse-related functions. It is recommended that the Nebraska Department of Natural Resources and the Nebraska GIS Steering Committee develop a Memorandum of Agreement to further define the nature and terms of this relationship.

3) Identify other existing geospatial data that is not currently listed in either of the existing metadata catalogs/clearinghouses via an online survey. Due to current resource limitations, the initial survey would focus on state agencies, institutions of higher education, and natural resources districts. The survey should identify not only what geospatial data exists, but also whether the data is documented. This online survey will be conducted primarily by the staff of University of Nebraska - Lincoln Libraries, with the assistance of the Coordinator for the Nebraska GIS Steering Committee.

4) Agencies with existing geospatial data, that is not been documented with metadata, will be encouraged and assisted to develop FGDC-compliant metadata to document their data. This is a necessary step before this data can be listed on FGDC-compliant geospatial clearinghouses and is consistent with the Nebraska GIS Steering Committee policy on metadata. *"To preserve the public's investment in geospatial databases and to facilitate data sharing, public agencies should document new geospatial data it collects or produces, either directly or indirectly, with metadata compliant with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (data describing the data). Systematic efforts should also be made to develop metadata for existing legacy geospatial data, as time and resources allow."* — adopted 3/9/00. Within the limits of available resources, the staff of UNL Libraries, the staff of Conservation and Survey Division UNL and the Coordinator for the Nebraska GIS Steering Committee will assist agencies to develop metadata.

5) Agencies with geospatial data, which has been documented with FGDC-compliant metadata, should be encouraged to list that data in the enterprise Nebraska geospatial data clearinghouse by adding the metadata to the clearinghouse catalog. This work would be conducted primarily by the staff of NDNR (as time and resources permit), with assistance from the Coordinator for the Nebraska GIS Steering Committee.

Longer-term institutional structures and policies

6) As resources become available, it is recommended that the Department of Natural Resources and the GIS Steering Committee work together to enhance the Nebraska geospatial data clearinghouse/center and provide a broader range of data access and support services for the enterprise-wide Nebraska GIS user community.

   For most GIS applications, it is very helpful if users can have ready access to the best available geospatial data. As the use of GIS-related technologies continues to grow across a broad range of state, local and federal agencies, and the private sector, there is a growing demand for reliable, timely access to the geospatial data that is developed and maintained by a variety of agencies. For applications related to public safety, emergency/disaster response or homeland security, it is vitally important to have ready access to the most current and accurate geospatial data available, that the data be maintained in a manner such that it can be rapidly integrated with data from multiple sources, and that the online access service is reliable in times of an emergency. Many states have found that state geospatial data access and support centers, designed to support the enterprise, are an efficient, reliable means to provide these specialized services of on-going geospatial data integration and online distribution. In developing an enterprise Nebraska geospatial service center, the following services and/or characteristics should considered:

   Recommended Services

   a) On-line Catalog and Data Access Point. An enterprise geospatial data center should develop and maintain a Nebraska geo-portal through which users could search for and

gain online access to a wide range of existing Nebraska-related geospatial data from multiple agencies (state, local, federal, and private). Data access services should be structured to provide the flexibility of either housing data directly on the center's servers or providing online access via hyperlinks to data residing on other agencies' servers. An enterprise geospatial data center could also provide an efficient avenue for investing in the secure and reliable information architecture necessary to insure ready access to critical geospatial information in times of natural disasters or other emergencies.

b) Help Desk. An enterprise geospatial data center should be structured to provide users with an initial single contact point for assistance in obtaining the most recent versions of a variety of dynamic geospatial databases and a first avenue of inquiry for basic questions related to those databases. Consequently, the data center personnel could relieve the skilled personnel in those agencies that are directly responsible for developing and maintaining these dynamic geospatial databases from the necessity of responding directly to many common day-to-day questions and requests related to those databases.

c) Data Integration. Databases developed by multiple agencies frequently require at least some manipulation before they can be integrated with other datasets. In some cases this manipulation may involve patching together several similar datasets from multiple jurisdictions to form a statewide dataset (i.e. street centerlines/addresses) or inserting a new update from one area into a larger statewide dataset. In other cases, this data manipulation may involve changing several datasets to common map projections or scales. Providing many of these data integration services through a data center would result in increased efficiency and accuracy in that these same data manipulations would be performed once by skilled technicians, instead of by the multiple users of the data, with varying levels of knowledge and skills. In emergency situations, this on-going data integration service could save critical analysis and response time.

d) Interactive Internet Mapping. Internet mapping is a rapidly growing trend in GIS software and applications development. Internet mapping applications go beyond using the power of the Internet to just locate and download existing geospatial databases. Internet mapping technology provides the ability to graphically display, combine and analyze geospatial data remotely. This evolution of GIS technology is having the effect of moving GIS applications from just the desktops of central office technical personnel, to putting these powerful tools in the hands of personnel in agency field offices and in the hands of the general public via the Internet.

   However, the application of Internet mapping technology requires an additional layer of technical skills, software, and hardware, in addition to the traditional GIS requirements. The provision of this service within the context of a broader geospatial data center would provide an efficient means for multiple government agencies to transition into this relatively new evolution in the technology. Providing this service through an enterprise data center would provide the opportunity for the multiple agencies, either with existing GIS capabilities or not, to explore the applications of this new technology without the necessity of their agency making substantial up-front investments in staff training and additional software and hardware purchases.

e) Technical Assistance. Significant public resources could be saved if GIS technical assistance was available to help guide state and local public entities in planning for and making public investments in GIS technology. An enterprise geospatial data center would be a logical place to provide such assistance. At the current time, policy makers and administrators, at both the state and local level, are called upon to make public

investment decisions related to the development and/or procurement of GIS data, hardware and software, and technical personnel, for which they have little or no experience. Absent that experience, it is relatively easy to make GIS-related investment decisions that can have costly long-term negative consequences. At the present time, there is no entity in state government charged with providing this type of GIS-related technical assistance. The nature of this assistance could vary widely. Many state or local agencies would benefit greatly from the availability of a consultant to help them plan an overall multipurpose GIS implementation strategy and to work with vendors on implementation. Technical assistance is needed to help define data needs and help negotiate with vendors for GIS data development to realize the required data quality and compatibility for the widest range of applications and users. The availability of limited technical assistance could also help stretch the capabilities of current agency personnel to develop new application and utilize new software capabilities without extensive additional training.

f) Pooling of resources. Many entities (state, local, federal and private) have need of similar geospatial databases (streams, roads, street addresses, digital photography, etc.). Great efficiencies can be gained, when these entities cooperate in the development and maintenance of geospatial databases needed by multiple entities, instead of developing duplicate or similar databases. In developing the organizational structures related to an enterprise geospatial data center, considerations should be given to incorporating mechanisms to help facilitate the voluntary pooling of resources that is frequently a key to achieving an aggregate level of resources that are necessary for many geospatial data development efforts.

Recommended Organizational Characteristics

g) State Agency – University Collaboration. Many states have found that there are benefits to be gained by developing an enterprise geospatial data center in an operational context that involves a state agency – university collaboration. Universities, in general, have more organizational flexibility and can draw upon a talented pool of students to help staff up to meet temporary project needs and to keep a data center on the cutting edge of technological evolution. University-related enterprises also frequently benefit from very significant price breaks from GIS software vendors. A university connection can also be helpful in drawing upon the education experience and technical expertise of the faculty in support of a technical assistance mission of the data center. On the other hand, a state agency connection can provide a more direct connection to changing state and local policies, priorities, and accountability. Given these potential benefits, opportunities for a collaborative state agency – university geospatial data center should be pursued.

h) Relationship with Nebraska GIS Steering Committee. The Nebraska GIS Steering Committee is the statutorily-defined (§81-2601) intergovernmental entity charged with establishing enterprise-wide GIS policies, priorities, and standards, including “The acquisition, development, maintenance, quality assurance such as quality control standards, access, ownership, cost recovery, and priorities of data bases”. For this reason, it is important for the overall coordination of the GIS enterprise in Nebraska that there be a close, and clearly defined, relationship between a Nebraska enterprise geospatial data center and the Nebraska GIS Steering Committee. As part of this relationship, the GIS Steering Committee should take an on-going, active role in assisting NDNR to explore opportunities for partnerships and collaboration as a means to enhance the services available through the Nebraska geospatial data center.

i) Enterprise Service Focus. If a geospatial data center is to be successful in providing the state's overall GIS enterprise with efficient and reliable services, such as on-going geospatial data integration, online data distribution, and technical assistance, it is important that it be designed and structured around an enterprise service focus. If the enterprise is to gain the maximum efficiencies and benefits from such a data center, it is important that the various entities within the enterprise feel that they can rely on these services being consistently available through the data center. Such reliability will minimize the tendency of other entities to develop similar or redundant systems to ensure the availability of these services. While it is probable that such a geospatial data center would be located within the context of an existing agency, policies and/or organizational structures should be considered to help buffer the enterprise data service center from the short-term fluctuations in the host agency's priorities. In a similar vein, to provide these reliable services to the enterprise, it would be important to the host agency that they have at least a minimum level of relatively stable funding to support this enterprise service function.